SHURE®
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MICROPHONES AND ELECTRONIC COMPONENTS
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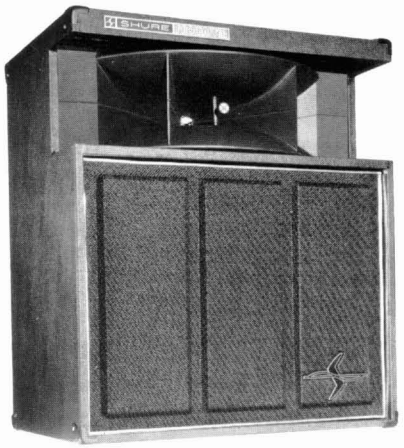
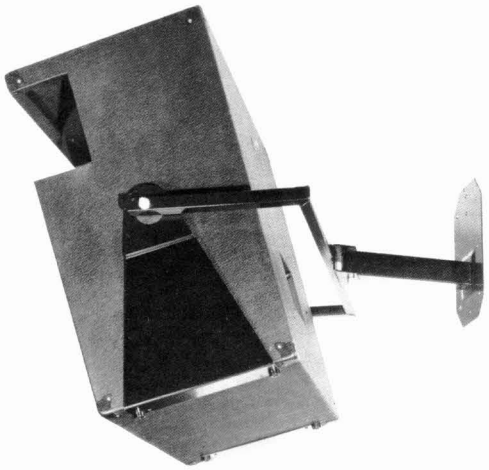
DATA SHEET

MODEL 701 PRO MASTER™ SPEAKER SYSTEM

OPERATION AND SERVICE INSTRUCTIONS





DESCRIPTION

The Shure Model 701 PRO MASTER™ Speaker System —a wide-range, high efficiency, lightweight, portable, two-way speaker system—is an ideal companion unit to Shure's Model 700 PRO MASTER Power Console or similar high-power amplifiers. The Model 701 provides high SPL sound reinforcement of wide frequency range program material in every location from the largest auditoriums to the most intimate clubs. The speaker system consists of a 15-inch woofer in a front-ported bass-reflex cabinet and a high-frequency horn and driver combination with an adjustment for either a 120° or 60° horizontal dispersion angle. The newly designed high power, high-frequency driver, manufactured exclusively by Shure, has a high-flux-density gap (more than 16,000 gauss) and a fatigue-resistant, high-temperature-tolerant diaphragm and coil assembly.

The 701 has a built-in passive high-frequency LC crossover network. The speaker system can easily be converted to biamplified operation. Below the 2,000 Hz crossover frequency, the crossover network rolls off at 18 dB per octave, providing the proper acoustic match and protecting the high-frequency driver. In addition, an overload protection circuit safeguards the high-frequency driver against damage from extremely high level signals. The low-frequency woofer rolls off acoustically above 2600 Hz.

The 701 system has a frequency response of 50 to 15,000 Hz and an impedance of 8 ohms. The system is designed to operate with amplifiers capable of delivering up to 150 watts continuous to an 8-ohm load.

The 701 is constructed of 15.9 mm (⅝ in.) wood and covered in scuff-resistant black vinyl. The black fabric grille is rugged, cleanable, and easily removable and replaceable. The corners of the cabinet are equipped with steel protectors. The 701 weighs only 26.4 kilograms (58 lb) and can be easily carried by grasping the cabinet at the top and sides of the horn. Proper lifting techniques should be observed when handling any equipment of this size and weight.

A heavy-duty, 15m (50 ft), 18-gauge, rubber-jacketed connecting cable with phone plugs is supplied with the speaker. A rugged vinyl slip-on protective cover with a cable pocket is available as Model A701C.

SPECIFICATIONS

Power Rating	Maximum recommended amplifier output to 8 ohms: 150 watts continuous, 34.6 Vrms, 55V peak
Impedance	8 ohms nominal (see Figure 1)
Frequency Response	50 Hz to 15 kHz (see Figure 2)
Crossover Frequency	2,000 Hz; high frequency: 18 dB/octave rolloff
Sound Pressure Level (SPL)	EIA rating: 53 dB at 9.2m (30 ft) from 1 milliwatt, equivalent to 102 dB at 1m (3.3 ft) with 1-watt input
Phasing (Polarity)	Positive voltage on phone jack tip produces positive sound pressure
High Frequency Section	120° or 60° (adjustable) radial horn, with high-power driver
Low Frequency Section	15-inch woofer
Horizontal Distribution	120° or 60° (see Figure 3)
Vertical Distribution	90°
Directivity Factor R_θ (Q)	6.6 at 2 kHz with 120° horn angle; 10 with 60° horn angle
Environmental:	
Operating Temperature	−7 to 43°C (20 to 110°F)
Storage Temperature	−29 to 71°C (−20 to 160°F)

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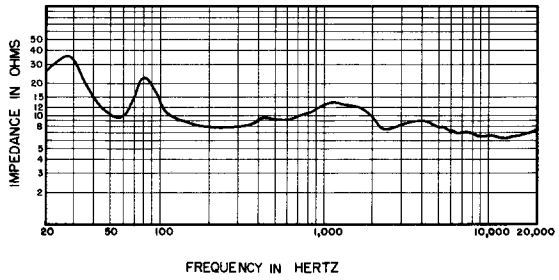
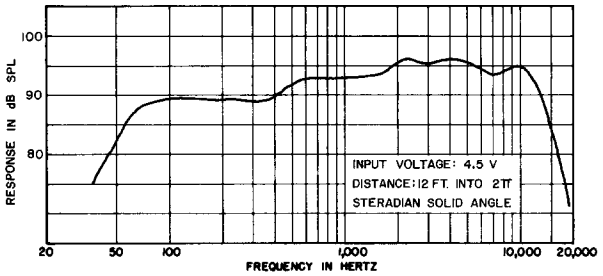
Printed in U.S.A.
Patent pending.

Connectors .....Two parallel-wired phone jacks
Cable .....15m (50 ft), 18-gauge, rubber-jacketed, with phone plugs

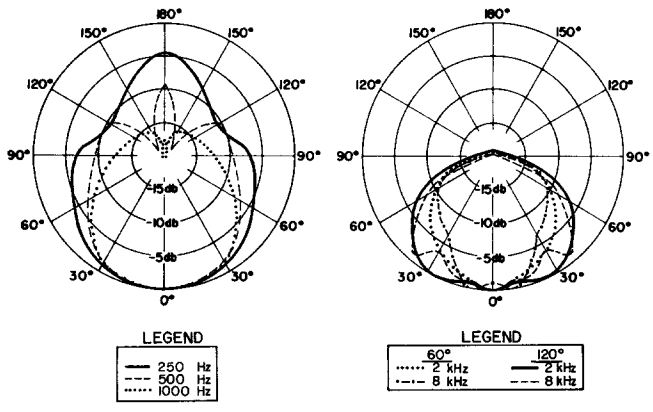


TYPICAL IMPEDANCE CURVE
FIGURE 1



TYPICAL FREQUENCY RESPONSE
FIGURE 2

Overall Dimensions
(including feet) .....702 mm H x 584 mm W x 402 mm D (27-5/8 in. x 23 in. x 15-13/16 in.)
Weight .....26.4 kg (58 lb)
Construction .....15.9 mm (5/8 in.) wood, black vinyl covering, black fabric grille, steel corner protectors, plastic feet
Optional Accessories ..A701C, Protective Slip-On Cover with Cable Pocket, A112D, Wall-Mount Swivel and Tilt Bracket, A102A, 70-volt Transformer



TYPICAL POLAR PATTERNS
FIGURE 3

INSTALLATION

General

Maximum coverage for source-oriented installations is generally obtained with the speakers on both sides of the sound source and as far forward as possible. Each speaker is tilted slightly either downward (for wall- or ceiling-mounted units) or upward (for floor-standing units). The angle of tilt (assuming a single speaker to each side of the sound source) should be such that you can look into the throat of the horn from the last rows of the audience area.

If it is desirable to elevate the 701, adequate support for heights up to about one meter (three feet) can usually be obtained using a sturdy table or bench. The surface must be capable of supporting the 26.4 kg (58 lb) weight of the speaker.

For greater elevations, the optional accessory Model A112D Wall Mount Swivel Bracket is designed to support the 701 for wall mounting only. It is important to note that the 701 is *not* designed for mounting by simple chains or cables attached to the cabinet top or sides. If the 701 must be supported by chains or cables, encircle or cradle it.

WARNING

It is extremely important that both the mounting surface and the mounting hardware are adequate to support the weight of the speaker. Inadequate support may result in a hazardous operating condition. Whatever mounting means are employed, support should be provided for a speaker static load of 105 kg (232 lb). Actual weight of the speaker is 26.4 kg (58 lb).

If two speakers are stacked for source-oriented installations, horn-to-horn mounting with horns angled apart to cover separate areas will provide the best sound dispersion pattern. It is recommended that the horn angles be set for 60° for stacked speakers.

Coverage Angles

The 701 Speaker System features a unique horn with an adjustable horizontal dispersion pattern. The 120° or 60° angle adjustment provides unprecedented flexibility that makes the 701 ideal in a wide variety of circumstances that previously required separate kinds of speakers to ensure adequate coverage.

Adjust the angle by turning the knob in the mouth of the horn so that "60" or "120" is in the detented vertical position. Use the 120° angle for coverage of short, wide areas, in "short throw" applications. Use the 60° angle for long, narrow areas, in "long throw" applications. The 60° position is also extremely useful when several speakers are employed to cover individual sectors of a very large hall or outdoor stadium.

Judicious speaker/microphone placement and/or the use of equalization or feedback filters in the sound system will often relieve acoustic feedback. In addition, narrowing the horizontal dispersion angle from 120° to 60° can be useful in remedying high-frequency feedback conditions when, for instance, speakers on stage have dispersion patterns that overlap the pickup areas of open microphones.

With the horn set at 60°, the energy in the high frequencies is concentrated in an area one half that of a 120° horn. This concentration causes an increase of approximately 3 dB in the high-end response. The extra high-end energy is extremely useful in providing maximum intelligibility for speech and singing voices and in

penetrating where acoustics are "dead" or where singers' voices must compete with loud amplified instruments on stage.

HOOKUP

Amplifiers

The 701 is designed for use with the Shure Model 700 Power Console and similar amplifiers having the following maximum power output capabilities.

	Continuous Power To:		
Voltage	16 ohms	8 ohms	4 ohms
34.6 Vrms (55V peak)	75 watts	150 watts	300 watts

Speaker Wiring

Fifteen meters (50 ft) of cable is supplied with each 701 Speaker System. For convenient attachment, a straight phone plug and a right-angle phone plug are provided. Connect either end to the back of the speaker and to the Power Console amplifier. The supplied cable is 18 gauge (No. 18 AWG) and can be used for cable runs of up to 15m (50 ft) between the speaker and the amplifier. If cable runs longer than 15m are required, use the following table to determine the correct wire gauge.

Maximum Distance From Power Console Amplifier	Wire Gauge	Recommended Cables
15m (50 ft)	AWG 18	Belden #8460, #8461, #9470, #8542
30m (100 ft)	AWG 16	Belden #8470, #8471, #8472
60m (200 ft)	AWG 14	Belden #8473

Preferably, each speaker should be connected to a separate amplifier output jack to minimize power losses in the cable. Two parallel-wired jacks are provided on the back of each 701 Speaker System. This allows connecting two speakers by connecting the first speaker to the amplifier and the second speaker to the first. This may be helpful in certain room shapes. However, when speakers are connected in this manner, the next heavier wire gauge is recommended between the amplifier and the first speaker. Therefore, for two speakers connected together where the first is at a distance of 30m (100 ft) from the amplifier, use No. 14 AWG cable between the amplifier and the first speaker; for two speakers where the first is at 15m (50 ft), use No. 16 AWG cable between the amplifier and the first speaker. When positioning the speaker cables, place them where the audience, performers, or passers-by will not trip over them.

To avoid frequency response aberrations, poor coverage, and dead zones caused by improper speaker phasing in multiple speaker installations, all speakers must be wired with the same polarity. The cables listed in the chart above are color-coded to ensure that identical connections are used. Note that even common 18-gauge lamp cord ("zip" cord) is phase-coded with ribs along the outer jacket of one conductor.

The cable can be stored in the convenient snap-pocket of the optional slip-on cover for the 701 speaker.

25-Volt Line Operation

The 701 can be operated from a 25-volt line without the need for an accessory transformer. Note that the speaker will draw 78 watts when connected to a constant-voltage, 25-volt line.

70-Volt Line Operation

For operation from a 70-volt line, a transformer such as the Shure Model A102A, providing power taps of 50, 25, 12, and 6 watts, should be used.

CHECKING SOUND COVERAGE

After the 701 speakers, Power Console amplifiers, and other equipment have been installed and connected, sound coverage can be checked as follows.

1. Apply a fairly constant-level signal to the system (preferably low-level pink noise* or program material) and walk around the audience area. Listen for a smooth, even output from the speakers, with minimal differences in volume and tone, and no "dead" spots or phase distortion.
   A. A dead spot—for audio purposes, where no direct sound is heard, or where the sound level is appreciably lower—may mean that the speakers are not covering that area, or that the speaker wires are connected out-of-phase. Proper phasing can be readily determined by checking the connections on each speaker, but inadequate coverage generally requires repositioning the speakers. The dead area should be examined carefully to determine that the problem can be corrected without resorting to auxiliary speakers.
   B. Phase distortion—a type of distortion distinguishable by being heard only in parts of the audience area—can be due to overlapping areas of speaker coverage or sound reflecting off hard surfaces. Re-aim the speakers or change the horn angle to 60° from 120° to eliminate this kind of distortion.
2. Use an Equalization Analyzer System such as the Shure Model M615AS to supply and analyze a pink noise signal. An octave equalizer like the ones found on the Shure Model 700 PRO MASTER™ Power Console (or separate equalizers like the Shure Models SR107 or M610) can be used to adjust the sound system for optimum equalization and maximum gain before feedback.

BIAMPLIFICATION

General

The 701 Speaker System can be modified for biamplified operation—where separate power amplifiers are used for high and low frequencies and are connected individually to the high and low frequency speaker sections. The advantage of biamplification is the elimination of high-frequency and intermodulation distortion caused by high-level low-frequency signals. The separate power amplifiers used in biamplification achieve the optimum matching of power available and maximize acoustic output.

Modification of the 701 for Biamplified Operation

1. Remove the 15-inch woofer as described in the *Service Instructions.* Take care not to break the leads to the speaker terminals or damage the cone.
2. Cut the red jumper lead that connects the two jacks on the panel inside the cabinet. Insulate both ends of the red jumper lead.
3. Note to which jack the woofer is directly connected. On the outside of the cabinet, mark this jack "LOW"; mark the other jack "HIGH".
4. Replace the woofer as described in the *Service Instructions.*

* Sine-wave signals delivering 150 watts to a speaker should be avoided because they present a much greater average power than does pink noise or program material. Consequently, when setting up or adjusting a sound system with the 701 speaker, avoid the use of high-level, continuous-type test signals.

Connections for Biamplified Operation

When the 701 has been modified for biamplified operation, each speaker section is designed to operate with an amplifier capable of delivering 150 watts continuous (34.6 Vrms, 55V peak) to an 8-ohm load. To biamplify, an active crossover, such as the Shure Model SR106, is required to separate the high and low frequencies. Set the crossover frequency at 2600 Hz, and connect the crossover high- and low-frequency outputs to separate amplifiers, such as the A and B Power Amps of the Shure Model 700 Power Console. Connect the speaker output from the low-frequency amplifier to the 701 jack marked "LOW"; connect the speaker output from the high-frequency amplifier to the jack marked "HIGH".

SERVICE INSTRUCTIONS

Diagnosing the Problem

1. Disconnect the speaker cables.
2. Using an ohmmeter, measure the resistance between the tip and sleeve of either phone jack. The dc resistance should be 5.5 to 6.5 ohms. A clicking sound will be made by a "good" woofer when an ohmmeter is connected or disconnected.

   NOTE: This test checks only the woofer because the crossover network is between the phone jacks and the high-frequency driver.
3. For access to the high-frequency driver and crossover network, proceed as follows.
   Note: This is most easily performed by supporting the cabinet on its back on a bench with the head of the large bolt in the upper center of the cabinet back hanging over the edge.
   A. Unscrew and remove the bolt from the upper center of the cabinet back.
   B. Pull the horn and driver assembly out until the crossover network clears the front of the cabinet.
   C. Disconnect the black lead that extends from the crossover to the jack panel. This will permit the driver to be partially removed from the cabinet. Note that the crossover and jack panel are still attached by a red lead. This lead has an insulated in-line connector. Push back the insulated sleeve and disconnect the terminals, completely freeing the horn and driver from the cabinet.
4. Using an ohmmeter, measure the resistance between the driver terminals. The dc resistance should be 5 to 7 ohms. A clicking sound will be made by a "good" driver as described in step 2 above.
5. If the above tests do not locate the problem, apply a small ac voltage from an oscillator and amplifier to each speaker individually. Use approximately 4V, 50 Hz to 3 kHz for the 15-inch woofer, and approximately 2V, 500 Hz to 15 kHz for the high-frequency driver. As the test signal frequency is varied, any erratic buzzes or rattles indicate possible problems.

WARNING

Sound pressure levels generated by this test may be damaging to your hearing. Aim speakers away from listeners and toward sound-absorbent material (curtains, blanket, etc.) Carefully adjust test signal amplitude to avoid unnecessarily high sound pressure levels for prolonged periods.

6. To reassemble, connect the jack panel leads: black lead to the crossover terminal with a black lead on it (outside terminal); reconnect the red lamp lead from the driver and the red lead from the jack panel. Slide the sleeve over to insulate the connector.
7. With the crossover facing the top of the cabinet, replace the driver and horn assembly by inserting it in the cabinet and firmly tightening the bolt.

Replacing the 15-Inch Woofer or Gaining Access to the Jack Panel

1. Remove the grille by pulling the two tabs at the top.
2. Remove the eight screws that hold the woofer in place.
3. Pull the woofer forward out of the cabinet and disconnect the red and black leads from the woofer terminals. The woofer is now free from the cabinet and can be lifted out and removed. Take care not to damage the cone nor to break the leads when performing this operation.
4. Before replacing the woofer, connect the leads: red lead to the coded terminal.
5. When reassembling, insert the woofer in the cabinet and tighten the eight previously removed screws.
6. Press the grille back in place.

Replacing the High-Frequency Driver

1. Remove the horn, driver, and crossover network from the cabinet as described in step 3 of the section *Diagnosing the Problem.*
2. At the crossover, disconnect the black, white, and red leads that come from the driver.
3. Unscrew the driver from the back of the horn. NOTE: The driver diaphragm and coil (RKC157) and the overload protection lamps (RKC166) can be replaced. Instructions for replacement are enclosed with the replacement part kit.
4. When reassembling, screw the driver to the back of the horn. The driver should be tightened by hand. Do not use a wrench or other tools.
5. Connect the black and white driver leads and the uninsulated red lamp lead to the crossover (see Figure 4): black lead to the terminal with a black lead on it (outside terminal); white lead to the terminal with the 9.4 μF capacitor soldered to its center (other outside terminal); red lead to the center terminal (between the two outside terminals).
6. Reassemble in the cabinet as described in steps 6 and 7 of *Diagnosing the Problem.*

ACCESSORIES

The following optional accessories are available for use with the 701 PRO MASTER™ Speaker System.

A701C Slip-On Protective Cover is a heavy vinyl cover that provides protection for the speaker. Has cutouts for the cabinet projections used as carrying handles. Equipped with a snap-pocket for cable storage.

A112D Wall Mount Swivel Bracket permits 90° rotation of the speaker about a horizontal axis, and 120° of horizontal rotation when mounted on a vertical surface. Heavy-duty steel construction.

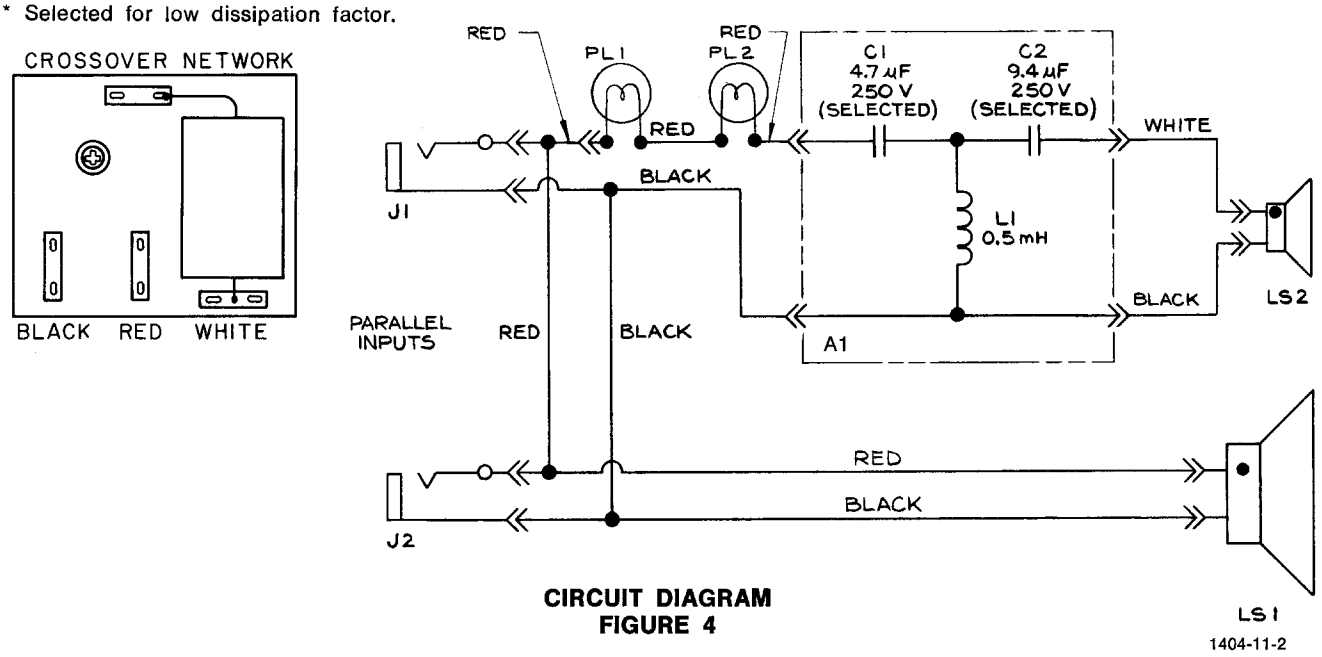
A102A 70-Volt Transformer provides wattage taps of 50, 25, 12, and 6 watts for 70-volt distributed systems, and impedance taps of 8 and 16 ohms. Mounts easily to the back of a speaker or convenient surface.

REPLACEMENT PARTS LIST

Reference Designation	Replacement Kit No.*	Replacement Kit Consists Of:		
		Qty.	Part No.	Description
A1	—	—	90A2838	Crossover Network
A2	RKC157	1	90A2636	High-Frequency Diaphragm and Coil
A3	RKC166	1	94A1483A	Overload Protection Kit (includes PL1, PL2 and mounting hardware)
C1	—	—	50A71	Capacitor, Mylar, 4.7 μF, 10%, 250 WVdc**
C2	—	—	50F71	Capacitor, Mylar, 9.4 μF, 10%, 250 WVdc**
J1, J2	—	—	90BA2600	Connector, Phone Jack, 2-Conductor, Open Circuit
L1	—	—	95A647	Inductor, 0.5 mH, 0.4 ohms
LS1	RKC158	1	80B363	15-inch Loudspeaker
LS2	—	—	90A2650	High-Frequency Driver (See A2 for Replacement Diaphragm and Coil)
MP1	—	—	90A2768	Grille
MP2	—	—	65A999A	Foot, Plastic
MP3	—	—	53A1656A	Corner Protector, Rear
MP4	—	—	53A1563B	Corner Protector, Front
MP5	—	—	65A1230A	Molded Horn, Top or Bottom Section (Order 2 for Complete Molded Horn)
MP6	—	—	90B2767	Knob
PL1, PL2	—	—	95A932A	Lamp, Automotive 1156
W1	RKC4	1	90C1373	Cable, 15.2m (50 ft), with Male Phone Plugs

* Parts listed as RKC Kits should be ordered by that kit number. Any orders received for piece parts where RKC Kit number is shown will be shipped in RKC quantities.

** Selected for low dissipation factor.



CIRCUIT DIAGRAM
FIGURE 4

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GUARANTEE

This Shure product is guaranteed in normal use to be free from electrical and mechanical defects for a period of one year from date of purchase. Please retain proof of purchase date. This guarantee includes all parts and labor. This guarantee is in lieu of any and all other guarantees or warranties, express or implied, and there shall be no recovery for any consequential or incidental damages.

SHIPPING INSTRUCTIONS

Carefully repack the unit and return it prepaid to:

Shure Brothers Incorporated
Attention: Service Department
1501 West Shure Drive
Arlington Heights, Illinois 60004

If outside the United States, return the unit to your dealer or Authorized Shure Service Center for repair. The unit will be returned to you prepaid.